Name _____

Draw Lines of Symmetry

Essential Question How can you find one or more lines of symmetry in some two-dimensional shapes?

G.9.3.1 Draw one or more *lines of symmetry* in a *polygon*

UNLOCK the Problem

Some shapes appear to have 1 or more lines of symmetry. Some shapes have no lines of symmetry.

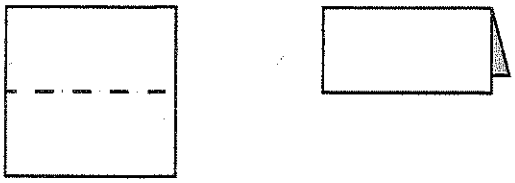
How many lines of symmetry does a square have?

Remember
A diagonal is a line segment that joins two vertices of a polygon that are not next to each other.

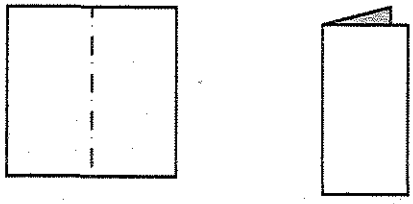
Activity

Materials ■ square shape

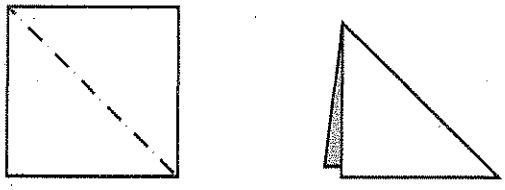
STEP 1 Fold a square in the middle of one pair of parallel sides. Do the parts match? _____



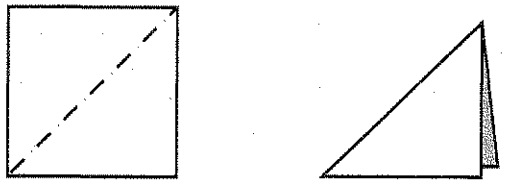
STEP 2 Unfold the square. Then fold it in the middle of the other pair of parallel sides. Do the parts match? _____



STEP 3 Unfold the square. Then fold it along a diagonal. Do the parts match? _____



STEP 4 Unfold the square. Then fold it along the other diagonal. Do the parts match? _____



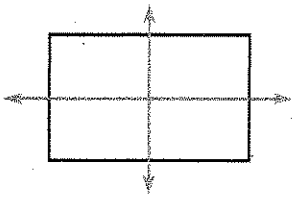
The square can be folded in the middle of both pairs of parallel sides. It can be folded along the diagonals. Because the parts match exactly, each fold is a line of _____.

Math Talk How do you know that you have found all the lines of symmetry in a shape?

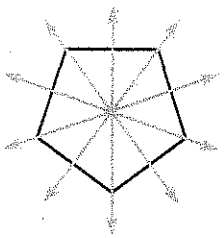
You have folded the square 4 different ways to make parts that match exactly. So, a square has _____ lines of symmetry.

Examples

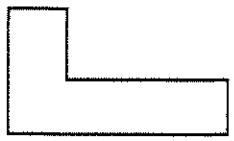
1 line of symmetry



2 lines of symmetry



5 lines of symmetry

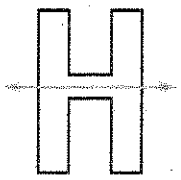


0 lines of symmetry

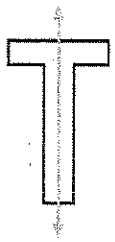
Try This! Some letters and numbers appear to have lines of symmetry.

Write the number of lines of symmetry or draw the lines of symmetry.

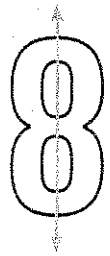
_____ line of symmetry



2 lines of symmetry



_____ line of symmetry

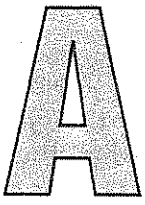


2 lines of symmetry

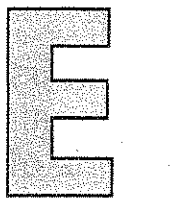
Share and Show

MATH BOARD

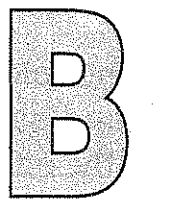
1. These letters appear to have lines of symmetry. Draw the line or lines of symmetry. Then write the number of lines of symmetry the letter has.



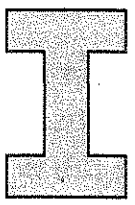
_____



_____



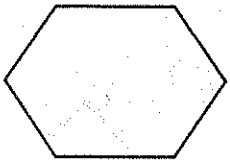
_____



_____

Name _____

Draw the line or lines of symmetry. Then write the number of lines of symmetry the polygon has.

2. 

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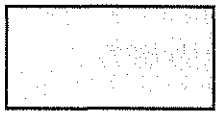
3. 

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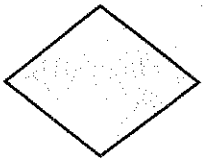
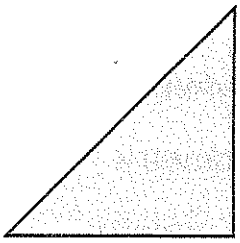
4. 

_____

Math Talk Explain how you can find all the lines of symmetry in a rectangle that is not a square.

On Your Own

Draw the line or lines of symmetry. Then write the number of lines of symmetry the shape has.

5. 

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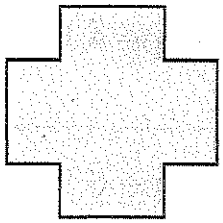
6. 

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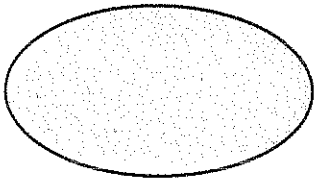
7. 

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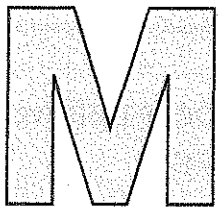
8. 

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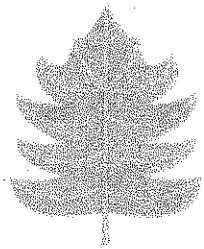
9. 

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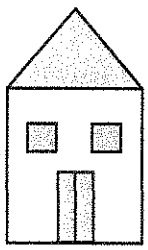
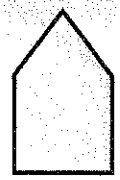
10. 

_____

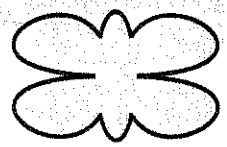
UNLOCK the Problem REAL WORLD

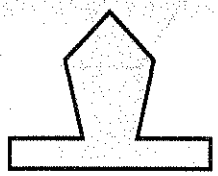
TEST PREP

11. Amber is making a book cover. She drew a shape on it that has exactly 2 lines of symmetry. Which shape did Amber draw for the cover?

Ⓐ  A

Ⓑ  B

Ⓒ  C

Ⓓ  D

a. What do you need to know? _____

b. How will you use what you know about symmetry to help you solve the problem? _____

_____

_____

c. Show the steps you use to solve the problem.

d. Complete the sentences.

Shape A has _____ of symmetry.

_____ has 5 lines of symmetry.

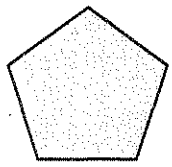
Shape C has _____ of symmetry.

_____ has 1 line of symmetry.

Amber drew _____ for the cover.

e. Fill in the bubble for the correct answer choice above.

12. How many lines of symmetry does this pentagon appear to have?



Ⓐ 0

Ⓑ 1

Ⓒ 2

Ⓓ 5

13. Which letters appear to have only 1 line of symmetry?

K X B O

Ⓐ K and X

Ⓑ X and O

Ⓒ B and O

Ⓓ K and B

Name _____

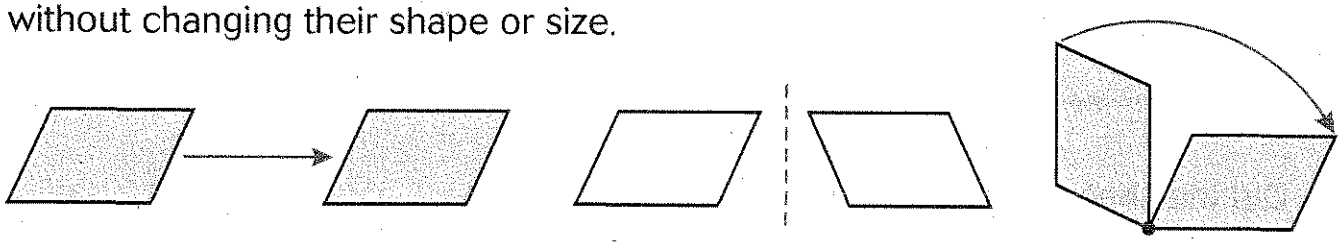
Translations, Reflections, and Rotations

Essential Question How can you use translations, reflections, and rotations to move a shape?

G.9.3.2 Describe the motion (*transformation*) of a *two-dimensional* figure as a *flip (reflection), slide (translation)* or *turn (rotation)*

UNLOCK the Problem REAL WORLD

Transformations are different ways of moving shapes without changing their shape or size.



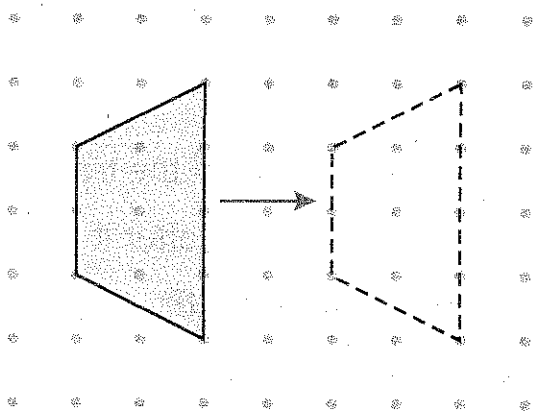
Translation (slide)

Reflection (Flip)

Rotation (Turn)

Activity 1

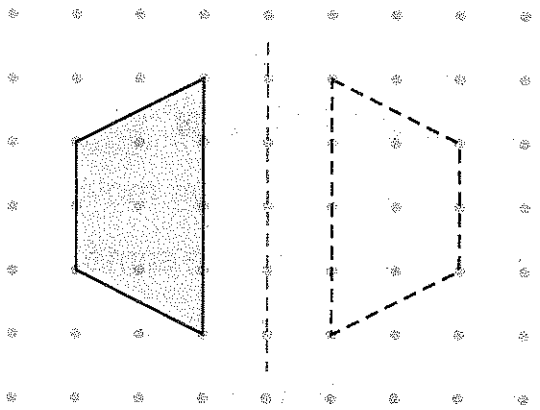
Look at the trapezoid on the left. Draw how the trapezoid would look after being translated to the right.



This move is a _____.

Activity 2

Look at the trapezoid on the left. Draw how the trapezoid would look after being reflected over the line

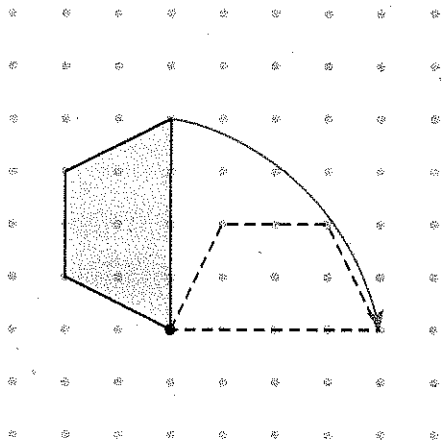


This move is a _____.

Math Talk Describe what is the same about the two trapezoids in Activity 2.

Activity 3

Look at the trapezoid on the left. Draw how the trapezoid would look if you kept the corner on the black dot and rotated the shape to the right.



This move is a _____.

1. Did the shape of the trapezoid change after it was translated? _____ after it was reflected? _____ after it was rotated? _____

2. Did the size of the trapezoid change after it was translated? _____ after it was reflected? _____ after it was rotated? _____

3. Did the position of the trapezoid change after it was translated? _____ after it was reflected? _____ after it was rotated? _____

Remember
Two shapes are congruent if they are the same shape and the same size.

Circle the correct word.

So, shapes that have been moved with a translation, reflection, or rotation are

congruent
not congruent

Share and Show

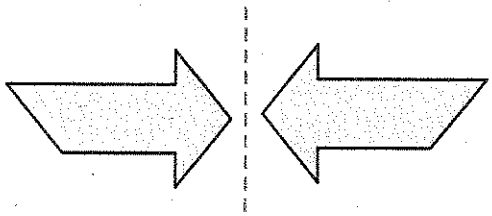
MATH BOARD

1. How was the shape moved? _____

Are the arrows the same shape? _____

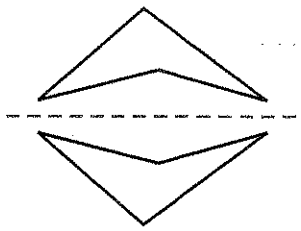
Are the arrows the same size? _____

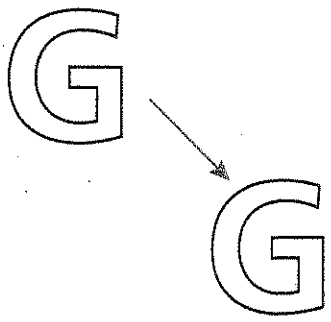
So, the arrows are _____.

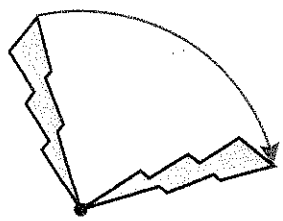


Name _____

Name the transformation shown. Write *translation, reflection,* or *rotation.*

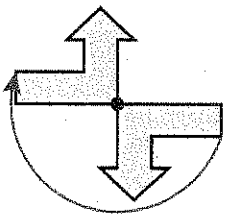
2. 

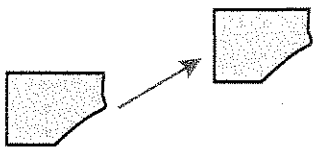
3. 

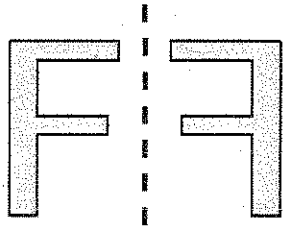
4. 

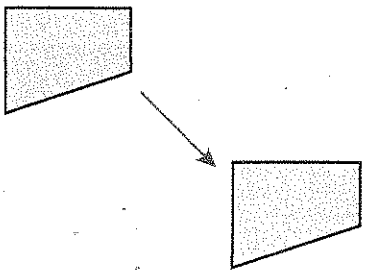
On Your Own

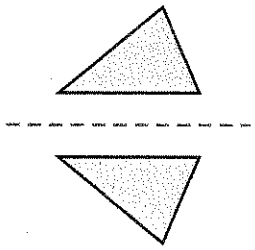
Name the transformation shown. Write *translation, reflection,* or *rotation.*

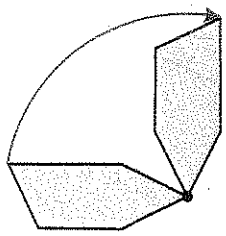
5. 

6. 

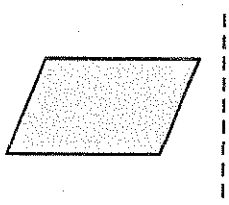
7. 

8. 

9. 

10. 

Draw how the shape will look after it is reflected over the dashed line.

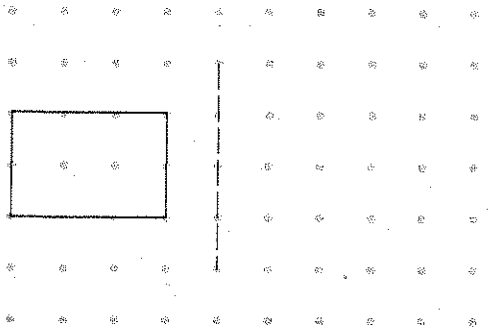
11. 

12. 

Problem Solving REAL WORLD

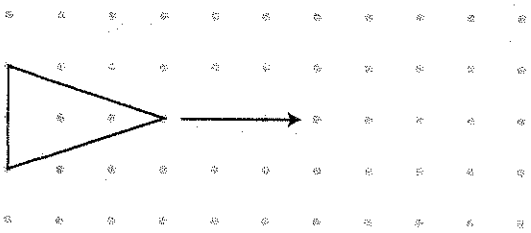
Perform each transformation.

13. Reflect the rectangle across the dotted line.

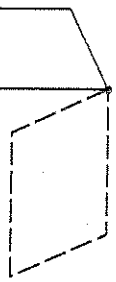


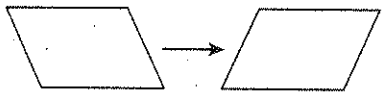
SHOW YOUR WORK

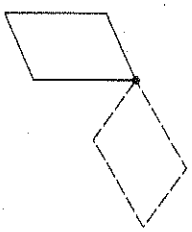
14. Translate the triangle along the arrow.

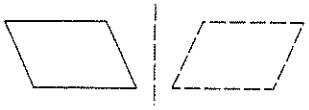


15. ★ **Test Prep** Which shows a rotation of a parallelogram?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

Name _____

Use a Coordinate Grid

Essential Question How can you describe locations of points using a coordinate grid?

G.10.3.1 Locate and identify points on a *coordinate grid* and name the *ordered pair* (*quadrant* one only) using common language and geometric vocabulary (horizontal and vertical)

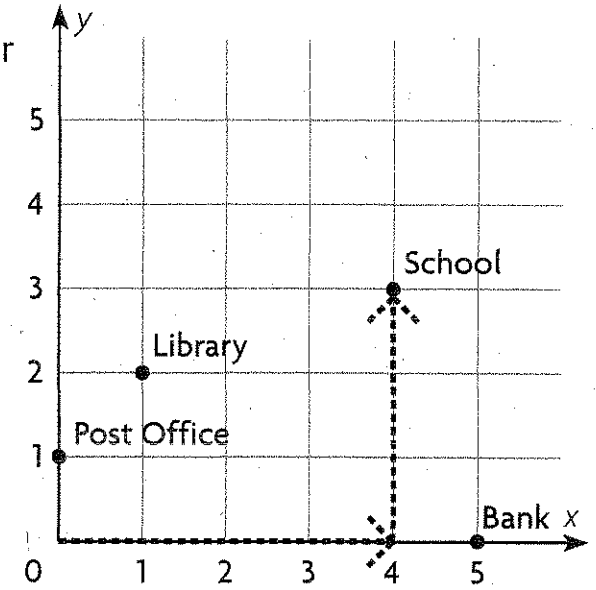
A grid formed by horizontal and vertical lines and used to graph points is called a **coordinate grid**.

An **ordered pair** is a pair of numbers used to locate a point on a coordinate grid. The first number tells how far to move horizontally left or right. The second number tells how far to move vertically up or down.

The ordered pair (4,7) means:
(4, 7)
move right 4 ↑ ↑ move up 7

UNLOCK the Problem REAL WORLD

Marnie makes a grid to show the places she needs to go after school. At what ordered pair is the school located?



Find the ordered pair for the school.

Start at 0. Look to see how far the point labeled School is from 0.

The point is _____ spaces to the right of 0. To get to the school I must move to the right _____ spaces.

The point is _____ spaces above 0. To get to the school I must move up _____ spaces.

So, the school is located at the point (_____, _____)

Try This!

Find the ordered pair for the bank.

Start at 0. Look to see how far the point labeled Bank is from 0.

To get to the bank I must move to the right _____ spaces.

Think: If you are already on the point, then you have to move no units, or 0 units vertically.

Then I need to move up _____ spaces.

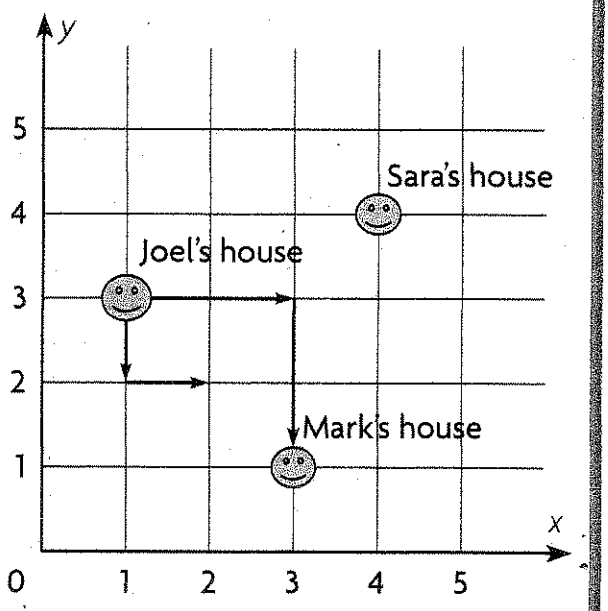
So, the bank is located at the point (_____, _____).

Math Error

The order of the numbers in an ordered pair is important. If you reverse the numbers it is a different point. For example, (2, 5) is **not** the same as (5, 2).

Move From One Point to Another.

On the grid at the right, Joel must walk from his own house to Mark's house. Describe a way Joel can walk along the grid lines to get to Mark's house.



One Way

Start at Joel's house. The coordinate pair for Joel's house is (_____, _____).

End at Mark's House. The coordinate pair for Mark's house is (_____, _____).

First, Joel will walk horizontally, and then he will walk vertically.

Joel will walk horizontally _____ spaces from point (1, 3) to point (3, 3). He will then move vertically _____ spaces to point (3, 1).

Math Talk Explain how you can tell the quickest way to get from one point to another.

Another Way

Joel can walk along the grid lines in other ways.

Joel starts his walk moving 1 space down to (1, 2), then 1 space to the right to (2, 2). Then he can move vertically down 1 space to (_____, _____), then horizontally right to (_____, _____).

1. Which path can Joel take to walk from his house to Sara's house? At what point on the grid will he be?

_____

_____

_____

2. Which house, Joel's or Mark's, is a shorter path to Sara's house? **Explain.**

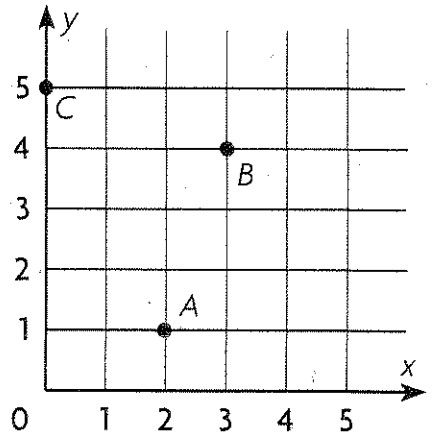
_____

_____

Name _____

Share and Show

1. Move from Point *A* to Point *B*.



First find the coordinate pair for Point *A*.
Start at 0.
Move right _____ spaces.
Move up _____ space.
The coordinate pair is (_____, _____).

Next find the coordinate pair for Point *B*.
Start at _____.
Move _____ spaces to the right.
Move _____ spaces up.
The coordinate pair is (_____, _____).

Then move from Point *A* to Point *B*.
Start at _____.
Move _____ space to the right. Move _____ spaces up.

2. Describe two different ways to move from point *B* to point *C* along the grid lines.

a. _____ b. _____

_____ _____

On Your Own

List the coordinate pair for each point. Then describe how to move from the first point to the second using one horizontal and one vertical movement.

3. Point *Q*: (_____, _____)
Point *M*: (_____, _____)

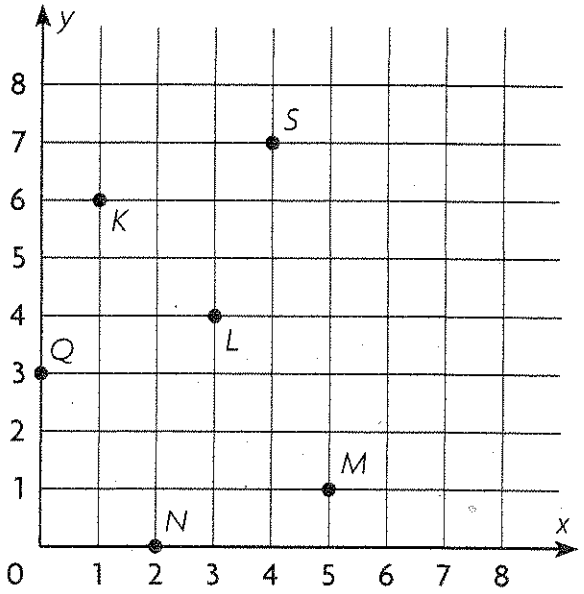
_____

4. Point *K*: (_____, _____)
Point *S*: (_____, _____)

_____

5. Point *N*: (_____, _____)
Point *L*: (_____, _____)

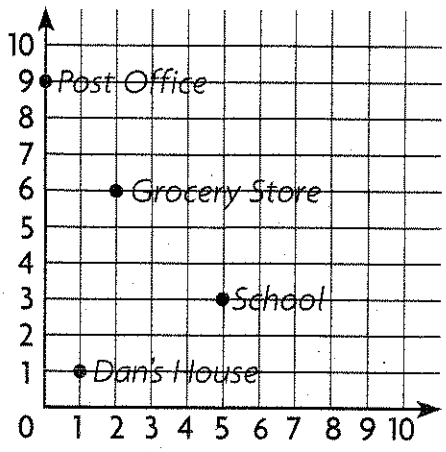
_____



Problem Solving REAL WORLD

TEST PREP

Use the diagram for 6–10.



6. Describe a way that Dan could walk from his house to the school using one horizontal and one vertical movement. Include the starting and ending coordinates in your answer.

_____

_____

7. Dan's mother needs to go grocery shopping. How could she drive from her house to the grocery store using one horizontal and one vertical movement? Include the starting and ending coordinates in your answer.

_____

_____

8. After she goes shopping, Dan's mother needs to mail a letter. How could she drive from the grocery store to the post office? Include the starting and ending coordinates in your answer.

_____

_____

9. HOT The coordinates for the library are (3, 4). Place the library on the coordinate grid.

10. ★ **Test Prep** What are the coordinates of the grocery store?

Ⓐ (1, 5)

Ⓑ (2, 6)

Ⓒ (5, 1)

Ⓓ (6, 2)

SHOW YOUR WORK